



# United States Department of the Interior

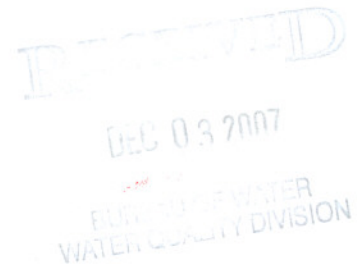
## FISH AND WILDLIFE SERVICE

176 Croghan Spur Road, Suite 200  
Charleston, South Carolina 29407



November 29, 2007

Ms. Amy Bennett  
Standards Coordinator  
Bureau of Water  
SC Dept. of Health and Environmental Control  
2600 Bull Street  
Columbia, SC 29201



Re: Proposed Amendment of Regulation 61-68, Water Classifications and Standards

Dear Ms. Bennett:

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed amendment and offers the following comments and recommendations for your consideration. This report is submitted in accordance with provisions of the Clean Water Act (33 U.S.C. 1251, *et seq.*), the Endangered Species Act, as amended (16 U.S.C. 1531-1543), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

The Service is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The agency enforces federal wildlife laws, administers the Endangered Species Act, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, and helps foreign governments with their conservation efforts. "Our mission is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

Protective water quality standards are important for the conservation and enhancement of fish, wildlife, and their habitats and for the continuing benefit of the American people. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, and the goal of this law is to establish national water quality that provides for the protection of fish, shellfish, and wildlife as well as providing safe recreational use of the Nation's waterbodies.

Current Service information shows that nearly 50 percent of the species at risk are water dependent. This means that nearly half of the species listed as endangered or threatened live in water throughout their life cycles, do so in one or more of the life stages, or depend heavily upon aquatic plants and animals as a food base. Of this 50 percent, about 20 percent are listed as





endangered and nearly 30 percent as threatened. Given these statistics on the plight of species, the goals of the Clean Water Act are all the more important. The quality of our Nation's and our State's waters is crucial to preventing extinction and showing recovery success of water dependent endangered and threatened species and protecting, restoring, and enhancing aquatic habitats in order to reverse the decline of native fishes and other aquatic species. We offer the following comments on South Carolina Regulation 61-68, Water Classifications and Standards, in the hope of furthering the Service's goals to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

#### Copper and Ammonia Water Quality Criteria for the Protection of Aquatic Life

The Service is particularly concerned that South Carolina's current aquatic life water quality standards (WQS) for copper and ammonia are not adequately protective of sensitive aquatic life, in particular the federally endangered Carolina heelsplitter (*Lasmigona decorata*) and other at-risk species of freshwater mussels in South Carolina. The Carolina heelsplitter once thrived in many streams and rivers of the Pee Dee, Catawba, Savannah, and Saluda River systems in North and South Carolina. When listed as endangered in 1993, there were only four known populations; two in North Carolina and two in South Carolina (one in the Lynches River system and one in Turkey Creek in the Savannah River system). As you can see from the attached map, additional populations have been discovered, including populations in seven tributaries of the Catawba River system (South Fork Fishing, Bull Run, Beaverdam, Sixmile, Cane, Waxhaw, and Gills creeks in York, Lancaster, and Chester counties). In 2001, the Service designated six areas as critical habitat, also shown on the attached map.

Freshwater mussels are the most imperiled group of animals in the United States, with about 70 percent of species listed as endangered, threatened, or of special concern. Environmental contamination is considered one of the causal or contributing factors. Studies have shown that glochidia, larval freshwater mussels, and juvenile freshwater mussels are more sensitive to some chemicals than commonly tested aquatic organisms (Wang *et al.* 2007a, 2007b). A multi-agency, multi-year study entitled "Developing Water Quality Standards for Recovery of Imperiled Freshwater Mussels (Family Unionidae)" has focused on the acute and chronic toxicity of the widely occurring aquatic contaminants copper, ammonia, and chlorine to early life stages of mussels because these early life stages have been demonstrated to be sensitive to copper and ammonia (Augspurger *et al.* 2003, March *et al.* 2007) and because limited chlorine toxicity data is available for mussels (Valenti *et al.* 2006).

Results of this study's toxicity testing show the chronic value (ChV, geometric mean of the no-observed-effect concentration and the lowest-observed-effect concentration) for copper ranged from 8.5 to 9.8 ug Cu/L for survival and from 4.6 to 8.5 ug Cu/L for growth (at a water hardness of 170 mg/L as CaCO<sub>3</sub>). The ammonia ChV ranged from 0.37 to 1.2 mg total ammonia N/L for survival and from 0.37 to 0.67 mg total ammonia N/L for growth (@ pH 8.2 and 20C). These ChVs are below the Environmental Protection Agency's (EPA) 1996 chronic water quality criterion (WQC) for copper (15 ug/L @ 170 mg/L hardness) and the 1999 WQC for total ammonia (1.26 mg NH<sub>3</sub>-N/L @ pH 8.2 and 20C) (Wang *et al.* 2007b) which are the bases of South Carolina's water quality standards.



The toxicity data utilized by the EPA in the derivation of WQC have not routinely included data generated for freshwater mussels. Recent studies have shown that the use of acute toxicity data for early life stages of mussels would lower the acute WQC for copper and for total ammonia ((March *et al.* 2007, Augspurger *et al.* 2003). These results indicate that the 1996 chronic WQC for copper and 1999 chronic WQC for total ammonia might not be adequately protective of freshwater mussels. In 2007, the EPA revised the aquatic life criteria recommendations for copper utilizing the biotic ligand model (BLM) rather than the hardness-based approach utilized in the 1996 WQC (Environmental Protection Agency 2007). March *et al.* (2007) evaluated the protection afforded freshwater mussels by the EPA hardness-based 1996 copper WQC, the EPA 2007 copper WQC based on the BLM model, and the State of Oklahoma copper WQS. Based on the freshwater mussel toxicity data used in this assessment, all of these WQC/WQS values may need to be revised to afford protection to freshwater mussels.

Ammonia, a pungent, colorless, gaseous alkaline compound, is high soluble in water and is both caustic and hazardous. Because of its many uses, ammonia is one of the most highly-produced inorganic chemicals in the world. It is toxic to fishes and other aquatic wildlife, causing effects ranging from reduced hatching success and reduced growth to loss of equilibrium, hyperexcitability, increased breathing, convulsions, coma, and death. Recent toxicity testing of two juvenile unionid mussels to ammonia measured mortality and growth in water-only and sediment tests (Newton and Bartsch 2007). In water-only tests, median lethal concentrations (LC50s) ranged from 157 to 372 ug NH<sub>3</sub>-N/L. Current EPA WQC and South Carolina WQS values are 1.26 mg NH<sub>3</sub>-N/L (@ pH 8.2 and 20C), an order of magnitude above the LC50s found in this study. In sediment tests, LC50s ranged from 124 to 125 ug NH<sub>3</sub>-N/L, while effective concentrations (EC50s) based on growth ranged from 30 to 32 ug NH<sub>3</sub>-N/L.

Copper is highly toxic in aquatic environments and has effects in fish, invertebrates, amphibians, and plants. Copper sulfate and other copper compounds are effective algacides (free copper ions are the lethal agent). Single-cell and filamentous algae and cyanobacteria are particularly susceptible to the acute effects which include reductions in photosynthesis and growth, loss of photosynthetic pigments, disruption of potassium regulations, and mortality. Sensitive algae may be affected by free copper in freshwater at concentrations as low as 1 ug/L (EPA 2007). In a study examining the effect of copper toxicity on the growth and morphology of Rhodes grass (*Chloris gayana*), an external copper concentration of <1 μM resulted in a reduction of root growth; symptoms observed during the study ranged from disruption of the root cuticle and reduced root hair proliferation to severe deformation of root structure (Sheldon and Manzie 2004). Thus, excess copper in the State's waters could adversely affect not only freshwater mussels but algae, plankton, bacteria, and aquatic plants which provide food and shelter for freshwater mussels and other aquatic species.

South Carolina's 2006 list of priority waterbodies pursuant to Section 303(d) of the Federal Clean Water Act identifies 91 waterbodies in the State as aquatic life impaired specifically due to copper. Another 141 waterbodies are listed as aquatic life impaired due to the poor condition of macroinvertebrate populations. The Service believes that adoption of copper and ammonia standards based on recent toxicity testing of freshwater mussels would be more protective of aquatic life and would facilitate restoration of aquatic life impaired waterbodies in South Carolina. On July 8th, 2004, the EPA notified the public of its intent to re-evaluate the current



aquatic life criteria for ammonia to determine if a revision is warranted based on new toxicity data for aquatic organisms, specifically that pertaining to freshwater mussels. As noted earlier, in 2007 the EPA issued a revision to the aquatic life ambient freshwater quality criteria for copper (BLM) which results in greater, if not yet adequate, protection for freshwater mussels and other sensitive species of aquatic life. The proposed revision to the State's WQS includes a provision that freshwater copper criteria "may be calculated utilizing the procedures identified in EPA 822-R-07-00" (BLM). The Service supports this proposal as a move in the right direction; however, we believe a more definitive approach is needed. We therefore recommend the following relative to the copper and ammonia WQS.

- The Department develop a copper and an ammonia WQS based on recent data from freshwater mussel toxicity testing as cited in this letter.
- In lieu of a copper WQS specifically incorporating data from these studies, adopt the BLM recommended by EPA 822-R-07-00 as the method via which the Department will determine freshwater aquatic life copper criteria.
- The Department develop site-specific copper and ammonia WQS based on recent data from freshwater mussel toxicity testing for waterbodies with existing populations of the Carolina heelsplitter and/or designated critical habitat.
- The Department designate waterbodies with existing populations of the Carolina heelsplitter and/or designated critical habitat as Outstanding National Resource Waters.

Related to our specific concerns about the Carolina Heelsplitter and other at-risk aquatic species, the Service also recommends the following.

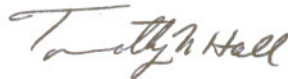
- Applicable critical flow conditions for aquatic life criteria are defined as the 7Q10 flow. According to recent correspondence with the Department, the last statewide update for the continuous record sites was completed in 1991 using data through 1987. Due to recent and current severe drought conditions, the 7Q10 needs to be updated for the State; the impact of existing discharges relative to these extremely low flows needs to be determined, especially in smaller streams where effluent discharge(s) constitutes the majority of the flow. Drought conditions are currently severely affecting the two North Carolina populations of Carolina heelsplitter. The Service recommends that the Department update the 7Q10 value and evaluate the effect of low flows and effluent discharges on aquatic communities, beginning with waterbodies with existing Carolina heelsplitter populations and/or critical habitat.
- In 2006, the American Society for Testing and Materials (ASTM) approved and published a revision to standard E2455 entitled "Standard guide for conducting laboratory toxicity tests with freshwater mussels." This new standard is designated E2455-06. Development of this method was one of the results of the afore-mentioned multi-agency, multi-year study on developing water quality standards for freshwater mussels. Further, Wang *et al.* (2007c) conducted multiple 48-hour toxicity tests with glochidia and 96-hour tests with juvenile mussels utilizing the new ASTM method within a single laboratory

and among five laboratories and found the test methods have acceptable precision and can be performed routinely. The Service recommends that Section E. 17. be modified to add freshwater mussel testing per method E2455-06 as an available test/analytical method and one which shall be utilized for determining compliance or non-compliance in waterbodies with existing Carolina heelsplitter populations and/or critical habitat.

- We also recommend that Section C.10. addressing mixing zones for surface waters be revised to specify that no mixing zones will be allowed in waters containing existing Carolina heelsplitter populations and/or critical habitat.
- We note that in Appendix D Determination of Attainment of Classified Uses as pertains to ammonia that "Where direct measurements of any of the parameters are lacking, the ammonia value will not be used to determine compliance with the standards." The "several associated field parameters" that must be measured concurrent with the ammonia sample collection are pH and temperature. These are easily measured in the field. Rather than eliminating ammonia values for determining compliance with the standards, we recommend that the Department specify that pH and temperature measurements must be taken concurrent with ammonia sample collections.

The Service appreciates the opportunity to provide these comments and recommendations, and we look forward to your response. If you have questions or would like to discuss any of our recommendations, please call Ms. Diane Duncan of my staff at (843) 727-4707 x218.

Sincerely,



Timothy N. Hall  
Field Supervisor

Attachment

TNH/CDD



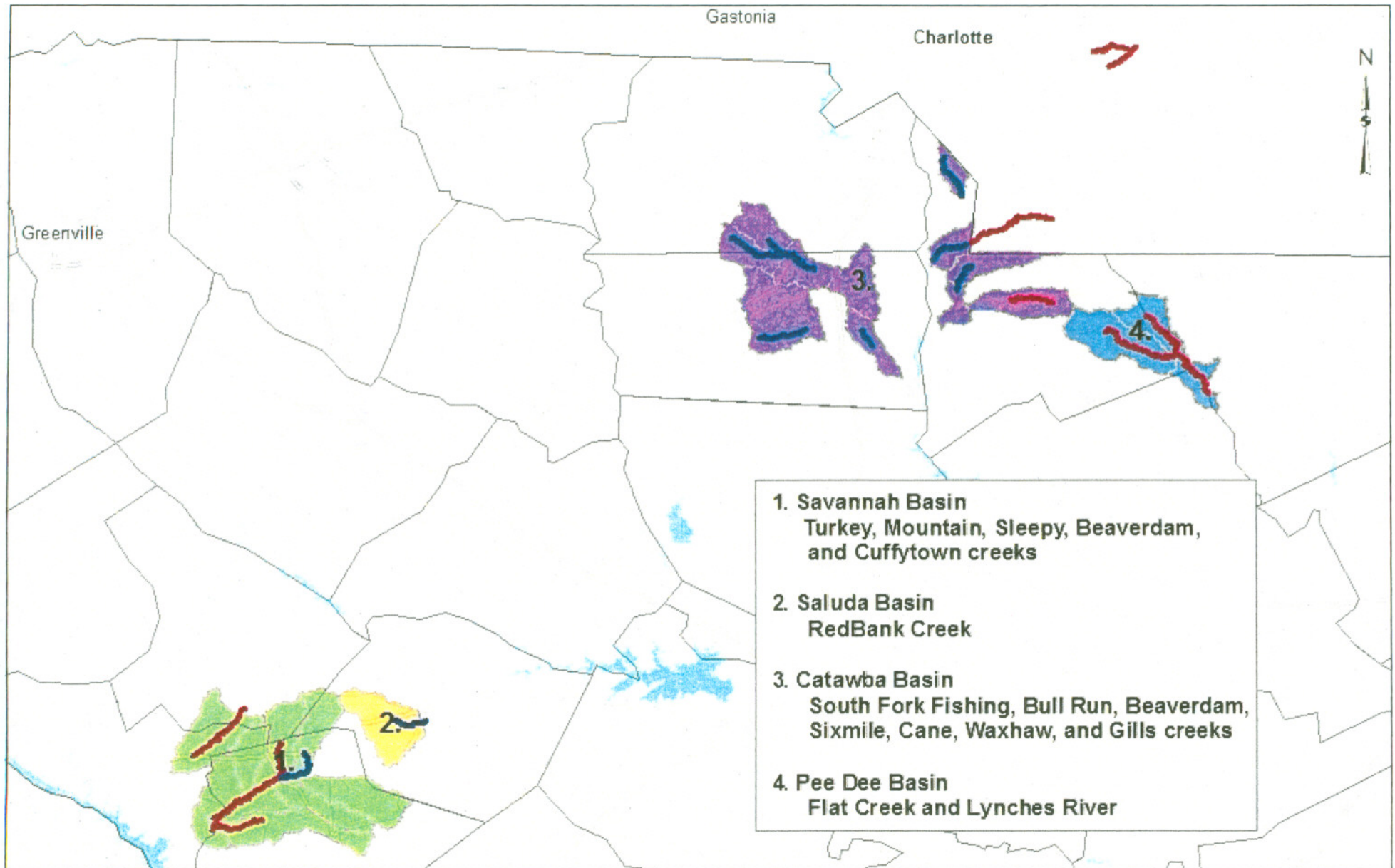
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U.S. Fish and Wildlife Service

## SOUTH CAROLINA WATERSHEDS CONTAINING CAROLINA HEELSPLITTER



Produced by:  
Charleston Ecological Services Field Office  
176 Croghan Spur Road, Suite 200  
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